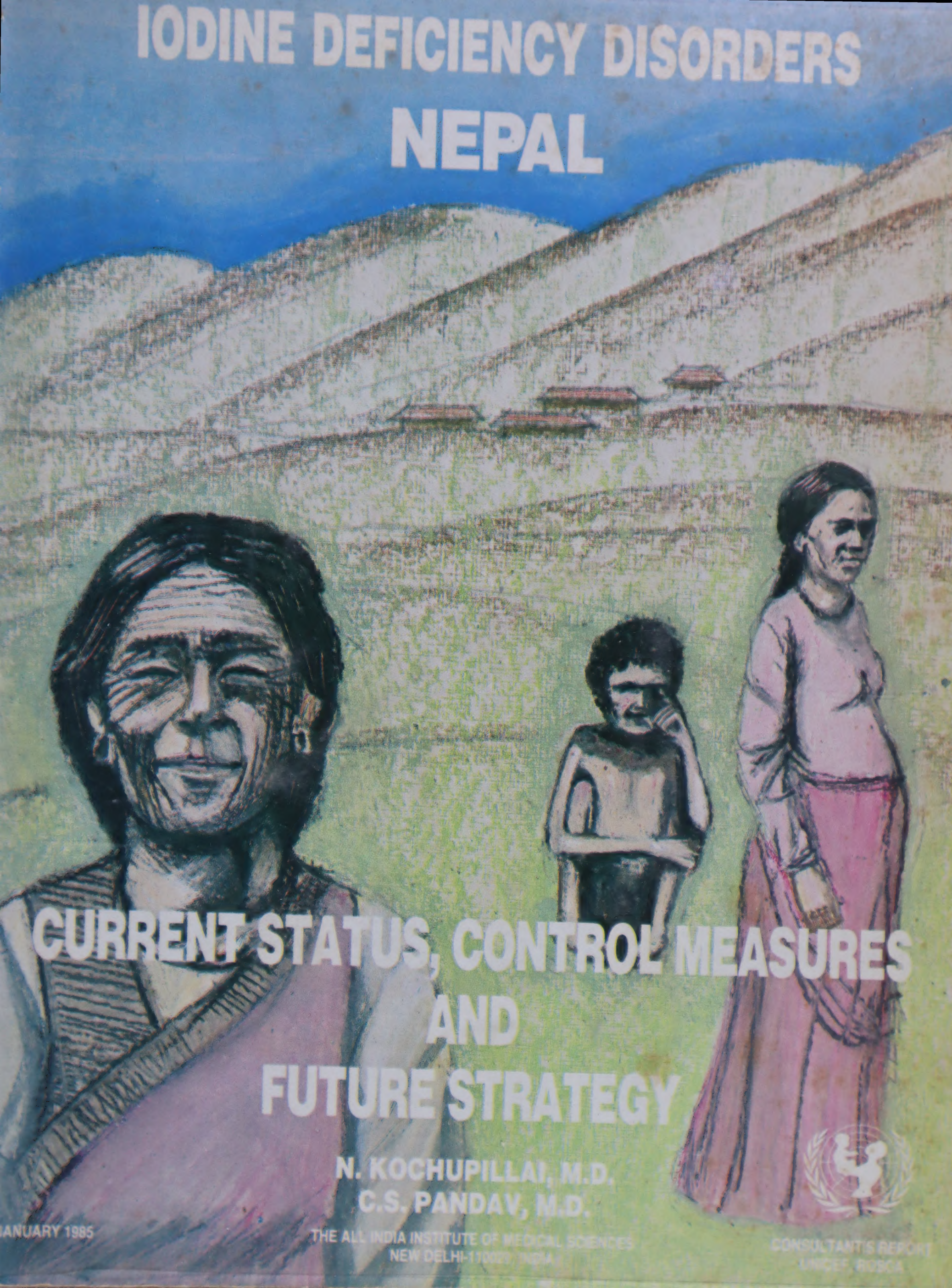
IODINE DEFICIENCY DISORDERS

NEPAL



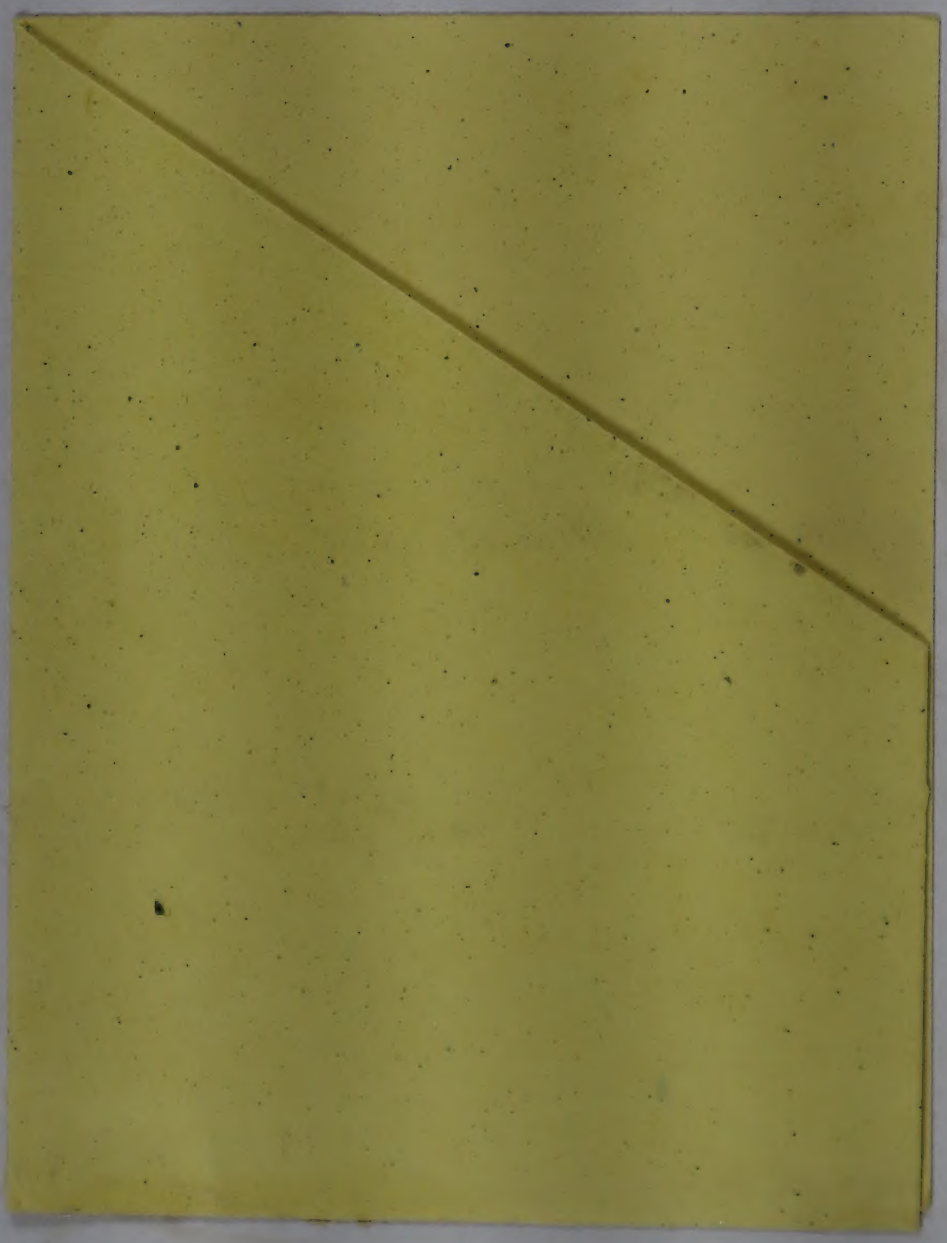
CURRENT STATUS, CONTROL MEASURES AND FUTURE STRATEGY

N. KOCHUPILLAI, M.D.
C.S. PANDAV, M.D.

THE ALL INDIA INSTITUTE OF MEDICAL SCIENCES
NEW DELHI-110029, INDIA

JANUARY 1985

CONSULTANT'S REPORT
UNICEF, ROSCA



IODINE DEFICIENCY DISORDERS IN NEPAL

CURRENT STATUS, CONTROL MEASURES

AND

FUTURE STRATEGY

BY

N. KOCHUPILLAI, M.D.
C. S. PANDAV, M D

THE ALL-INDIA INSTITUTE OF MEDICAL SCIENCES
NEW DELHI 110 029, INDIA

CONSULTANTS' REPORT
UNICEF, ROSCA
NEW DELHI, January 1985

IODINE DEFICIENCY DISORDERS IN NEPAL
CURRENT STATUS, CONTROL MEASURES AND FUTURE STRATEGY

Page

CONTENTS

EXECUTIVE SUMMARY 1

1. INTRODUCTION 3

2. ENDEMIC GOITRE IN NEPAL 4

2.1 A Report by HMG, Nepal, 1965-1967 4
2.2 Assignment Report on Goitre Control, Nepal by Prof. Ramalingaswami and team, 1969 4

3. SALT IODATION PROGRAMME IN NEPAL 6

3.1 Introduction 6
3.2 Current Status 7
3.3 Monitoring of the Programme 10
3.4 Future Strategy 13

4. IODISED OIL INJECTION PROGRAMME 14

4.1 Introduction 14
4.2 Current Status 15
4.3 Future Strategy 16

5. IODINE DEFICIENCY DISORDERS CONTROL PROGRAMME 17

5.1 Future Strategy 17
5.2 Need for Monitoring and Surveillance System 19

6. REFERENCES 21

/...

CONTENTS

Page

7. TABLES

I - Goitre Survey Results in Nepal of Persons 13 Years old and above. 22

II - List of Corresponding Towns on Nepal Side, Procurement of Iodated Salt. 23

III - Potassium Iodate Determinations in Crushed Salt Samples. 24

IV - Iodine Content of Salt Samples Analysed at Food Research Laboratory, Kathmandu. 25

V - Pre-Iodation and Post-Iodation (Pre-Iodised Oil Injection) Urinary Excretion of Iodine (UEI) Pattern in Some Districts of Nepal. 26

VI Pre-Iodation and Post-Iodation (Pre-Iodised Oil Injection) Goitre Prevalence in Some Areas of Nepal. 27

VII - Districtwise Distribution of Population Injected with Iodised Oil Injection. 28

VIII - Prevalence of Goitre and Cretinism in Nepal. 29

8. ACKNOWLEDGEMENT 30

EXECUTIVE SUMMARY

1. Based on available reports, the entire country of Nepal was seriously affected by Iodine Deficiency Disorders (IDD). In 1973, a salt iodation programme was implemented in the whole country with assistance from the Government of India.

2. Available information on goitre prevalence and urinary iodide excretion (UEI) pattern in Nepal, 3 to 7 years after the initiation of salt iodation programme, clearly reveal amelioration of the severity of iodine deficiency. However there is reason to believe that adequate amounts of iodine may not be reaching all parts of the country to effectively control Iodine Deficiency Disorders in Nepal.

3. The iodised oil injection programme mounted on the 23 hill districts during last 6 years is reported to be highly successful with a coverage of 72.6% of the total population. Unfortunately, this programme was initiated without gathering baseline data on the status of IDD. It was important to have gathered such data base before launching the injection campaign, particularly in view of the partial success of the ongoing salt iodation programme, observed in some parts of the country.

4. It is important to take stock of the existing status of IDD in the country before considering any new approach towards IDD control in Nepal. A countrywide study of the current status of IDD is, therefore, proposed to be undertaken, in a representative cross section of the population, on a random sampling basis. Besides incorporating geographic, ethnic and ecological regions, the areas to be covered by the study should also incorporate,

/...

(a) those districts which have been covered by the iodised oil injection campaign;

(b) those districts where iodated salt coming from India is not likely to reach with adequate iodine content and are not covered with iodised oil injections (mainly the hill districts not covered by Iodized Oil Injection Programme);

(c) those districts where iodine is apparently reaching in satisfactory levels through iodated salt, i.e., Kathmandu valley and other important populous townships in Nepal.

5. The parameters of IDD to be assessed in the study include:

(a) Goitre prevalence;
(b) Prevalence of cretinism, particularly in younger generation (less than 10 years);
(c) urinary iodide excretion pattern in various population groups and
(d) incidence of neonatal hypothyroidism.

6. Such a study would provide information on

(a) the impact of the ongoing countrywide salt iodation programmes;
(b) the impact of the recently completely iodised oil injection programme in the 23 districts and
(c) permit a situational analysis of the IDD in the country.

7. Information gathered in such a study would be of vital importance to plan and implement future strategy of IDD Control in Nepal.

/...

1. INTRODUCTION

The whole of Nepal is recognised to be seriously affected with Iodine Deficiency Disorders (IDD). A salt iodation programme has been in existence in Nepal, for more than a decade. Yet, comprehensive studies to assess objectively the impact of the ongoing salt iodation programme, so far, have not been undertaken. Meanwhile, iodised oil injection programme has been launched since fiscal year 1979-1980 in 23 remote hilly districts of country as an alternative mode of iodine prophylaxis. We visited Kathmandu between 29 and 1 January 1985, with the objective of (i) to familiarizing with the current status of IDD and its control in Nepal (ii) drawing up a plan of action that would lead to a comprehensive study of IDD and its prophylaxis in Nepal.

During our sojourn in Kathmandu, we met representatives of national and international agencies concerned with the IDD programme. The present report is based on information gathered during this visit.

/...

2. ENDEMIC GOITRE IN NEPAL

2.1 A REPORT BY HMG, NEPAL, 1965-1967

It has been generally known for a long time that goitre is highly endemic in Nepal. His Majesty's Government (HMG), Nepal, as a part of general health survey, carried out goitre prevalence surveys from 1965 to 1967 in 19 villages throughout the country. The villages were selected in a representative manner to include all the ecological zones of the country, covering one in every 1500 of the population[1]. In addition, school and college surveys were carried out in Kathmandu, in Dharan, Maternal and Child Health clinics in Kathmandu valley and Biratnagar and also among patients and relatives attending hospital services in four different hospitals of Nepal[1]. A total of 7466 persons were examined. Of these, 5265 were above 13 years and the goitre prevalence rate observed in them was 55%. The results of this survey which confirmed seriousness of endemic goitre in Nepal, are summarised in Table - I. Besides, the hilly districts, the populous districts of Nepal Terai were also found to be endemic for goitre. It was, therefore, concluded that endemic goitre is widely prevalent in Nepal[1].

2.2 ASSIGNMENT REPORT ON GOITRE CONTROL, NEPAL BY PROFESSOR RAMALINGASWAMI AND TEAM, 1969

Though countrywide clinical surveys of the type referred to above were done, scientific study on the etiology and health consequences of endemic goitre were for the first time, undertaken in 1967 by Prof. Ramalingaswami and team

/...

from the All India Institute of Medical Sciences, New Delhi [2]. They conducted studies in two widely separated areas, one in Trisuli, situated in central part of Nepal and the other in Jumla, situated in North-Western part of the country. Their findings can be summarised as follows:

(i) Goitre prevalence in two areas ranged from 74% to 100%.

(ii) Cretinism, deaf-mutism and related developmental defects of central nervous system were widely prevalent.

(iii) Iodine deficiency was found to be the cause of goitre as was evident from

(a) consistently low iodine concentrations in water samples collected from the two areas. The iodine content ranged from 0.086 to 0.157 ug per litre of water while in non-endemic area, it averaged 9 ug per litre;

(b) low intake of iodine as reflected by low mean urinary iodide excretion (UEI) of less than 22 ug per gm of creatinine;

(c) elevated 24 hr ^{131}I uptake of the thyroid. The value ranged from 72% to 85% and

(d) very low plasma inorganic iodide levels (estimated by isotope dilution technique) which ranged from 0.015 to 0.017 ug per dl.

Their report also adduced evidence to show that goitre in Nepal is a thyroid stimulating hormone (TSH) dependant

/...

compensatory response to iodine deficiency. This was shown by doing tri-iodothyronine (T_3) suppression test in a small sample of the population. They also showed evidence of significantly low levels of circulating Thyroxine (T_4) hormone in these two study areas by demonstrating low Protein Bound Iodine (PBI)levels as compared to non-endemic areas[2].

In view of the evidence that endemic goitre in Nepal is a problem of serious public health significance and that severe iodine deficiency is its cause, it was recommended by Prof. Ramalingaswami and his team that a National Goitre Control Programme be launched to ensure a constant and continuous supply of iodine to the people. For this purpose, fortification of all edible salt with Potassium Iodate (KIO_3) at the level of 25 parts per million (PPM) was recommended[2].

3. SALT IODATION PROGRAMME IN NEPAL

3.1 INTRODUCTION

In conformity with the recommendations made by Prof. Ramalingaswami and his team, Salt Iodation Programme was launched by HMG Nepal in 1973. The Government of India and HMG, Nepal entered into an agreement for preventing and controlling the prevalence of goitre in Nepal[3]. According to the agreement, the Government of India would provide funds:

(i) to meet the cost of iodation of salt to the extent of 100,000 tons (1 lakh tons) per year

/...

(ii) to meet the construction of warehouses for storage of salt

(iii) to meet the cost for establishment of 100,000 tons capacity iodation plants in Nepal; and

(iv) to subsidize transport cost of salt to 20 inaccessible districts and packing, stamping and labelling of bags.

Since 1973, iodated salt is procured from India and distributed in Nepal[3].

3.2 CURRENT STATUS

During our discussions with Mr. H. B. Malla, General Manager, Salt Trading Corporation (STC), Nepal, the following picture of iodated salt procurement, storage and distribution in Nepal emerged[12].

According to Mr. Malla, practically the entire edible salt requirement of Nepal comes from India. The total quantity of Tibetan salt reaching Nepal is only 250 tons, i.e., 0.25% of the country's total annual requirement[3]. Since the formation of STC, scarcity of salt has not been reported from Nepal. According to Mr. Malla, if the Indian salt reaching Nepal is adequately iodated, the daily requirement of iodine of the population can be definitely met[12].

Three varieties of salt from India are imported to Nepal to meet the specific preference of people living in the Terai, Hill and Mountainous regions. Bargara salt, which has big and hard crystals is preferred in Hill and Mountain region

/...

and comes form Kharaghoda (Gujarat). The two varieties of Sambhar salt, i.e., Kyar salt of big crystals and Reshta salt of small grains (powdered salt) is preferred in Terai region and comes form Sambhar Lake (Rajasthan). Since 1974, the maximum import of salt has always been from Kharaghoda[3]. In 1984, a total of 60,000 tons of salt, i.e., 75% of total import, came from Kharaghoda[4]. The reported level of salt iodation is at 25 parts per million (PPM) at both the iodated salt production centres in India[3].

Iodated salt is packed in jute bags containing 75 kg or 100 kg at both Kharaghoda and Sambhar Lake. The salt bags are transported by Indian Railways in covered wagons[12]. It takes 2 to 6 weeks to reach the nearest railway station on the Indian side of the Nepal border. Since there are heavy demurrage charges for delays in offtake, the salt is immediately transported by road to the towns of Nepal and stored in STC warehouses (godowns) before being transported to interior areas[12]. The names of 11 towns on the Indian side and corresponding town on Nepal side where salt is received for distribution is given in Table -II. The maximum quantity of salt is transported from August to March[4]. This period coincides with the time when people of hills trek down to the towns in Southern Terai[1]. They come down with their collection of animal products, animals, surplus food and homemade products to exchange with salt, cloth and other goods. The annual requirement of salt and other commodities are bought by them once in a year and carried back to their homes in high mountains.

HMG Nepal has plans to instal six iodation plants at six major entry points in Nepal, with the assistance from Government of India (Table - II)[3]. The total estimated

and comes form Kharaghoda (Gujarat). The two varieties of Sambhar salt, i.e., Kyar salt of big crystals and Reshta salt of small grains (powdered salt) is preferred in Terai region and comes form Sambhar Lake (Rajasthan). Since 1974, the maximum import of salt has always been from Kharaghoda[3]. In 1984, a total of 60,000 tons of salt, i.e., 75% of total import, came from Kharaghoda[4]. The level of salt iodation is maintained at 25 parts per million (PPM) at both the iodated salt production centres in India.

Iodated salt is packed in bags of 75 kg or 100 kg jute bags at Kharaghoda and Sambhar Lake. The bags are transported by Indian Railways in covered wagons. It takes 2 to 6 weeks to reach the nearest railway station on the Indian side of the Nepal border. Since there are heavy demurrage charges for delays in offtake, the salt is immediately transported by road to the towns of Nepal and stored in STC warehouses (godowns) before being transported to interior areas. The names of 11 towns on the Indian side and corresponding town on Nepal side where salt is received for distribution is given in Table -II. The maximum quantity of salt is transported from August to March[4]. This period coincides with the time when people of hills trek down to the town in Southern Terai[1]. They come down with their collection of animal products, animals, surplus food and homemade products to exchange with salt, cloth and other goods. The annual requirement of salt and other commodities are bought by them once in a year and carried back to their homes in high mountains.

HMG Nepal has plans to instal six iodation plants at six major entry points in Nepal, with the assistance from Government of India[3] (Table - II). The total estimated

/...

annual production capacity of these plants is expected to meet the annual requirement of 100,000 tons. STC, Nepal has constructed covered salt storage godowns at 10 places of which 7 are along the border and 3 in the interior (Table -II). The total capacity of storage is about 25,200 tons, representing three months requirement. In addition, open storage-yards for storing salt bags are available. An additional storage facility for 12,000 tons at 16 places is being planned by STC, Nepal. The administrative network of STC is well spread out in almost all the traditional commercial centres in Nepal. Wholesale salt dealers, appointed by the STC, take delivery of salt from main godowns once a month. The retailers collect their quota of salt on a weekly basis from the wholesalers. The consumers purchase salt from retailers and store it for a period ranging from one week to one year. At the consumer level salt is stored in wooden caskets or in the bag itself and hung from on the roof, so that it does not get wet. If kept on the floor, it is stored near the hearth.

3.3 MONITORING OF THE PROGRAMME

There is virtually no existing facility in Nepal to monitor iodine content of salt soon after its arrival from India, at the storage godowns, at the wholesale outlets, or at consumer level.

There have been two reports so far which provide data on iodine content of iodated salt samples collected from Nepal. Dr. Jean Lequien, UNICEF Consultant, writes in the "Feasibility Report on Production and Distribution of Iodized Salt for Goitre Control in Nepal" that "Quality of iodization

/...

operations should be made evident by methodical control of the prevalence of malady all over the country and by regular basic analysis of samples at the consumption level. Assessment on defects of iodization operation in India should be based on results of systematic studies"[5]. During his visit to Nepal in 1976, he collected salt samples which were analysed for iodine content by Food Research Laboratory, Kathmandu. The results show that Potassium Iodate content of crushed salt coming from India, collected from railheads, godowns and retail shops varies from 10 to 28 PPM of Potassium Iodate (Table - III)[5]. However, the results of analysis of salt samples for iodine content by Delange and Velix in the same year, i.e., 1976, show that iodine content of Indian salt collected from Kathmandu market and Rasuwa valley varied between 0.20 to 2.94 PPM (Table - IV)[6]. According to their studies, the iodine content of Indian salt was certainly higher than the iodine content of Tibetan salt collected from Kathmandu market and Jumla valley (Table - IV)[6].

All the salt samples were analysed at the same laboratory, i.e., Food Research Laboratory atKathmandu. The period and place (godown, retail shops, etc.) of collection, the time between arrival of salt and collection and analysis of salt samples, are, however, not mentioned in their report[6]. It should be noted that Indian salt samples collected by Delange and Velix is iodated at very unsatisfactory level, whereas Indian salt samples collected by Lequien, has satisfactory level of iodation. The reason for discrepancy observed by these two groups of investigators is not obvious.

/...

Indirect information on the availability of iodine through iodated Indian salt to the Nepalese population can be had by comparing the available pre- and post-salt iodation data gathered by various workers. A comparative assessment of goitre prevalence and urinary iodide excretion (UEI) pattern gathered by Ramalingaswami et al in 1969 (pre-salt iodation) with those gathered by Delange et al in 1976, Bhattaran &Reader in 1979, Bergman et al in 1980 (post-salt iodation), reveal interesting facts (Table - VI)[2,6,7,8,9]. This information, though not strictly comparable from the point of sampling procedures adopted, population and age-sex groups surveyed, inter-observer variations, etc. nonetheless form the data base. However, for the classification of goitre prevalence, comparable criteria have been used for assessment of goitre size. This data base, provide indications of an improved status of iodine nutrition of the population in the post-salt iodation period (Table - VI).

A comparative evaluation of urinary excretion of iodide (UEI) observed by Ramalingaswami et al, prior to salt iodation, i.e., in 1969, with the data adduced by Bergman et al after salt iodation, i.e., in 1980, clearly establish the availability of iodine through Indian iodated salt to the consumers (Table - V)[2,7]. However, it can be admitted that the quantity of iodine available to the consumers in remote areas may be at suboptimal level. These findings are reflected in the goitre prevalence data gathered before and after introduction of salt iodation in Nepal (Table-VI)[2,6,7,8,9]. Thus, goitre prevalence in the age group 15 to 20 years reported by Ramalingaswami et al in Trisuli area surveyed before the introduction of iodated salt was 74% with visible goitre prevalence of 40%. Surveys carried by Delange et al, in the same age group (15 to 19 years) and in the same year in 1976, three years after Salt Iodation Programme showed goitre

prevalence of 35.6% with a visible goitre prevalence of 7.7%. A similar reduction of goitre prevalence was also observed in the other population groups examined by different investigators (Table -VI). These studies seem to clearly demonstrate that iodine is indeed available through Indian iodated salt, though admittedly at suboptimal levels.

The inference of iodine availability through the Indian salt made above is reinforced by preliminary observations made by us in Kathmandu Valley during our recent visit in January 1985. Thus, during our sojourn in the valley, we consistently failed to observe visible goitre among younger generations. Survey done in the 57 school children present on the day of our visit in the Laboratory School, Kirtipur, Kathmandu Valley, showed overall goitre prevalence of 21% with a visible goitre prevalence of only 2%. Though these observations are necessarily preliminary when taken in the context of UEI pattern reported by Bergman et al in Nepal (Table - V)[7], they indicate that iodine is available through iodated salt coming from India. However, we wish to underscore the fact that these are preliminary observations made from few areas and therefore not valid in the general context. In the light of these impressions a more systematic and comprehensive study of IDD in Nepal is essential to assess the precise impact of the iodated salt coming from India, particularly in such areas where iodised oil injections have not yet been mounted.

3.4 FUTURE STRATEGY

In view of the preliminary impressions of partial impact of iodated salt programme on Iodine Deficiency

/...

Disorders in Nepal, it is important to launch a systematic evaluation of the problem in all those districts of the country where iodated salt is believed to be reaching. This should be done in a random sample of the population of the country representing various geographic, ethnic and socio-economic groups and taking district as a unit. Such an evaluative study, using the parameters of goitre and cretinism prevalence and UEI pattern and, if feasible, incidence of neonatal hypothyroidism (NH) would provide sound data on the effectiveness or otherwise of the existing salt iodation programme in Nepal. It would also provide evidence to assess the impact of salt iodation programme in those regions of the country where iodated salt directly reaches, without any delay, thus presumably ensuring adequate iodine content in it. Information thus gathered would be helpful to mount alternative strategy of iodine prophylaxis in those regions where salt iodation is proven to be a failure. In addition, a situational analysis can be carried out to assess the reasons for failure of salt iodation programme and suggest appropriate remedial measures.

4. IODISED OIL INJECTION PROGRAMME

4.1 INTRODUCTION

The use of iodized oil injections was first investigated by Ibbertson and coworkers in the remote village of Waspa in the Everest region of Nepal. The palpable and visible goitre rates in this village were estimated to be 90% and 60%, respectively. Cretinism was observed in 13% of the population. Most of these were deaf-mutes, and in about half, obvious intellectual defects and growth retardation was evident[10]. In 1966, approximately 1200 inhabitants received

/...

intramuscular injections of iodized oil. During an expedition six years later, in 1972, a limited survey showed clear reduction in the goitre prevalence in the treated group. Clinically, hypothyroidism was less evident. Only one cretin had been born - to an untreated woman in the village where previously the prevalence of cretinism was 13 per cent[10].

4.2 CURRENT STATUS

The Goitre and Cretinism Eradication Project was established by His Majesty's Government (HMG), Nepal in 1979 as a separate project attached to the Expanded Programme on Immunization (EPI), Department of Health Services, with the following objectives:

(i) To reduce the incidence of endemic goitre and cretinism in the Northern Mountainous Districts of the country where iodated salt is currently not available;

(ii) To stimulate an awareness of the cause and consequences of goitre and cretinism in the general population and among government officials;

(iii) To assess and evaluate alternative and inexpensive intervention methods for control of goitre and cretinism in Nepal.

During the HMG fiscal year 1979-1980, the project was in the planning stages. Injection campaigns were carried out in Jumla and Rasuwa districts to test the methods of project implementation.

/...

The full scale project implementation of the programme began in fiscal year 1980-1981. As of 1982-1983, a total of 15 districts with an estimated population of 11,86,973 were covered. The total number of people who received injections was 8,62,160 comprising 72.6% of the target population. Districtwise distribution of population injected with iodised oil is given in Table - VII[6,11]. The reported coverage rate of this injection campaign is indeed impressive. With this degree of success, one would expect a dramatic improvement in the form of

(i) marked decreased prevalence of goitre in the population;

(ii) decreased prevalence of cretinism in the emerging generation and

(iii) improvement in the pattern of urinary excretion of iodide (UEI) in the population covered.

However, no systematic studies were done to gather the data base on goitre and cretinism prevalence as well as UEI pattern in the population before the injection programme. In fact, the iodised oil injection campaign should have been mounted only after conducting evaluation about the impact of the already existing salt iodation programme. Such an evaluation would have not only provided information to assess the status of salt iodation programme but also would have provided important data base to assess the impact of the planned iodised oil injection programme.

4.3 FUTURE STRATEGY

In the absence of such a data base, the best that can be done is to take the data gathered on prevalence of goitre

/...

and cretinism (Table - VI and Table - VIII) and mean urinary excretion of iodide (Table - V) in 1976 by Bergman et al and Delange et al as the pre-iodised oil injection data base[2,6,7,8,9]. An evaluative study, on a randomized sampling basis should not be done in the 23 districts covered by the injection campaign, to assess the impact of the programme on

(i) goitre prevalence;
(ii) prevalence of cretinism in emerging generation and
(iii) urinary excretion of iodide (UEI) patternof the population.

Such a study would provide indicators the would test the veracity of impressive coverage by the iodised oil injections campaign. In addition, it would also provide rationale basis for deciding the future course of action - that of mounting fresh iodised oil injection campaigns in the districts already covered as well as for mounting similar campaigns in new districts.

5. IODINE DEFICIENCY DISORDERS CONTROL PROGRAMME

5.1 FUTURE STRATEGY

For reasons already detailed above, it is our considered opinion that for designing future strategy for IDD control in Nepal, it is critical to take stock of the current status of IDD in Nepal. The impact of the ongoing Iodated

/...

Salt Programme, as well as Iodised Oil Injection campaigns recently completed in 23 districts, should be evaluated without further delay. The following course of action is recommended towards achieving the above.

(i) Systematic and randomized study on a sampling basis to assess the extent and severity of IDD in those districts of Nepal where there is ongoing Salt Iodation Programme.

(ii) A similar study in the 23 districts where Iodised Oil Injecting campaign has been mounted since 1979-1980.

(iii) A comparative assessment of the data gathered from these two studies is anticipated to provide the following information, when examined in the light of the previous reports[2,7,8].

(a) Impact of the ongoing Indian Iodated Salt Programme in those districts where there is no other ongoing mode of prophylaxis.

(b) Impact of the recently completed Iodised Oil Injection campaign in the 23 districts covered by the programme.

Depending on the information gathered by the above studies, a future strategy of iodine prophylaxis can be drawn up, based

/...

(a) entirely on iodised oil;

(b) entirely on iodated salt, by appropriate modification of level of iodine fortification; or

(c) by a combination of the two modes.

5.2 NEED FOR MONITORING AND SURVEILLANCE SYSTEM

In view of the serious health consequences of iodine deficiency and the universal experience of frequent breakdown of ongoing Salt Iodation Programmes, continued vigilance by an effective three-tier system of monitoring and surveillance should be organized as an integral part of IDD Control Programme in Nepal. Such a system should be built within the framework of existing health care delivery system in the country. From our preliminary discussions in Kathmandu, we understand that there exists a countrywide network of health posts supported by a network of laboratory infrastructure[13]. This network, should be reinforced with appropriate manpower, material and money to build up an efficient system of monitoring and surveillance of IDD Control Programme for the whole country.

The three-tier system of monitoring and surveillance, we envisage, comprise of

(i) monitoring of iodine content of salt at different levels of salt distribution - from the railheads to the consumers;

/..

(ii) monitoring iodine availability to the population by measuring urinary iodide in randomly collected urine samples and preparing UEI pattern charts;

(iii) monitoring incidence of neonatal hypothyroidism, in a random sample of new-borns, with the help of existing health infrastructure in the country.

Such a system would be helpful in achieving effective IDD control by the year 2000 A.D., or even before, in Nepal.

REFERENCES

1. "Endemic Goitre in Nepal". Paper presented by the Government of Nepal at the Seminar on Endemic Goitre, WHO Regional Office for South-East Asia (document SEA/Goitre Sem/3) October, 1967.

2. Ramalingaswami V, Deo M.G., Karmarkar M.G.: Assignment Report on Goitre Control, Nepal, WHO Regional Office for South-East Asia (document SEA/26) February 1970.

3. Subramanian P: Control of Iodine Deficiency Disorders in Nepal. Unicef, ROSCA, New Delhi, March 1984.

4. Minutes of the discussion between the representatives of Salt Trading Corporation Ltd., Kathmandu, Nepal and Hindustan Salts Limited, Jaipur held at Jaipur, July 1984.

5. Lequien Jean: Feasibility Report on production and distribution of iodized salt for goitre control in Nepal. UNICEF, Kathmandu, Nepal, April 1976.

6. "Goitre and Cretinism Control in Nepal - A Situation Report" HMG Ministry of Health, Goitre and Cretinism Eradication Project (EPI), Dillibazar, Kathmandu, Nepal, 1983.

7. Delange F, Valix P: Endemic Goitre and Cretinism in Trisuli". WHO Preliminary Report, October 1976.

8. Bergmans A, Delange F, Thilly C.H: "An Integrated Strategy of Goitre and Cretinism Control for Nepal by Iodinated Oil and Iodized Salt. WHO Consultation Report, 1980.

9. Goitre and Cretinism: Report on Iodinated Oil Injection Training Programme in Jumla District. Goitre and Cretinism Eradication Project, Kathmandu, June 1980.

10. Project Agreement between His Majesty's Government of Nepal and United Nations Children's Fund, Kathmandu, 1981-1982.

11. Shreshtha Ramesh: Goitre and Cretinism Eradication Project. Summary of Fiscal Year 1982-1983. Report prepared for UNICEF Kathmandu, Nepal. 1983-1984.

12. Malla HB - Personal Communication.

13. Gurubacharya Vijaya - Personal Communication.

.....

TABLE - I

GOITRE SURVEY RESULTS IN NEPAL OF PERSONS 13 YEARS OLD AND ABOVE

Sr.No.	Geographical Area	STUDENTS EXAMINED IN KATHMANDU FROM THESE AREAS		EXAMINED IN MCH CLINIC		EXAMINED DURING VILLAGE HEALTH SURVEYS		TOTAL EXAMINED		
		No.	Goitre %	No.	Goitre %	No.	Goitre %	Total No.of Villages	No.	Goitre %
1.	Kathmandu Valley	487	143 (29%)	313	174 (56%)	328	242 (74%)	2	1128	559 (50%)
2.	East Terai	163	42 (26%)	505	179 (35%)	749	553 (58%)	5	1617	774 (48%)
3.	East & Central Inner Terai & Mid West Terai	44	18 (41%)	103	25 (24%)	511	168 (33%)	3	658	211 (32%)
4.	Eastern Mountains	113 126*	43 (38%) 33*(26%)	N.E.	–	160	51 (32%)	2	399	127 (32%)
5.	Western Mountains	215	100 (47%)	N.E.	–	882	793 (90%)	5	1097	893 (81%)
6.	West Terai & West Inner Terai	20	7 –	N.E.	–	346	329 (95%)	2	366	336 (92%)
	GRAND TOTAL:	1168	386 (33%)	921	378 (41%)	3176	2136 (67%)	19	5265	2900 (55%)

* Students in Dharan from Eastern Mountains

** Please note that the last column is prepared to give a single figure "guestimate" of different regions.

N.E. Not Examined.

TABLE - II

LIST OF CORRESPONDING TOWNS ON NEPAL SIDE, PROCUREMENT OF IODATED SALT, EXISTING STORAGE FACILITY AND PROPOSED LOCATION OF SALT IODATION PLANTS IN NEPAL*

Sr.No.	Towns on Indian Side	Towns on Nepal Side	Quantity of iodated salt received from India for the year 1984-1985 (in tons)			Existing godown facility (in tons)	Salt Iodation Plant(No.)
			Khargoda	Sambhar Lake	Total		
1.	Gauriphanta	Dhangadhi	4,000	Nil	4,000	1,500	Yes, 1
2.	Nepalganj Road	Nepalganj	6,400	Nil	6,400	2,000	Yes, 1
3.	Nautanwa	Bahirawa	27,200	5,000	32,200	5,000	Yes, 1
4.	Raxual	Birganj	11,200	2,000	13,200	4,000	Yes, 1
5.	Jogbani	Biratnagar	1,600	9,000	10,600	3,000	Yes, 1
6.	-	Janakpur	Nil	Nil	Nil	2,000	Yes, 1
7.	Banbassa	Mahendranagar	1,600	1,000	2,600	1,000	No
8.	Tikunia	Rajapur	3,200	Nil	3,200	Nil	No
9.	Barhni/Shoharatgarh	Taulihawa	4,800	Nil	4,800	Nil	No
10.	Naxalbari/Galgalia	Bhadrapur	Nil	3,000	3,000	Nil	No
11.	Jayanagar N.S.	Jayanagar	Nil	Nil	Nil	Nil	No
12.	Nirmali	Rajbiraj	Nil	Nil	Nil	Nil	No
13.	-	Pokhra	Nil	Nil	Nil	2,500	No
14.	-	Kathmandu	Nil	Nil	Nil	4,000	No
15.	-	Jumla	Nil	Nil	Nil	200	No
		TOTAL:	60,000	20,000	80,000	25,200	6

*Source: References 3 & 4

TABLE - III

POTASSIUM IODATE DETERMINATIONS IN CRUSHED SALT SAMPLES*

(Sampling made by the mission during its assignment in Nepal)

S.No.	Place of Collection	No. of Samples Analysed	Pot.Iodate Content (PPM)	Comments
1.	Biratnagar Godown	1	12	Arrived from India, 13th - 26th February, 1976
2.	Dharan Shop - 1	1	10	Salt one month in shop
3.	Dhran Shop - 2	1	18	Salt one month in shop
4.	Rajbiraj Godown	1	28	Arrived from India, 19th Feb. 1976
5.	Janakpur Godown	1	10	Arrived from India Oct. 1975
6.	Raxual Railhead	1	10	Arrived from India 28th Feb. 1976

- All samples taken between 26th February - 1st March, 1976
- Determination carried out by Food Research Laboratory, Kathmandu.

* Source: Reference No.5

TABLE - IV

IODINE CONTENT OF SALT SAMPLES ANALYSED AT FOOD RESEARCH LABORATORY, KATHMANDU*

S. No.	Place of Collection	Place of origin of salt	No. of samples analysed	Iodine content ug/kg.	Iodine content PPM
1.	Kathmandu Market	Indian	30	0.45 to 2.94	0.45 to2.94
2.	Kathmandu Market	Tibetan	25	0.03 to 0.23	0.03 to 0.23
3.	Jumla	Tibetan	30	0.20 to 1.10	0.20 to 1.10
4.	Rasuwa	Indian	15	0.20 to 2.90	0.20 to 2.90

* Source: Reference No.6

TABLE - V

PRE-IODATION AND POST-IODATION (PRE-IODISED OIL INJETION)
URINARY EXCRETION OF IODIDE (UEI) PATTERN IN SOME DISTRICTS OF NEPAL*

S.No.	District	Pre-Iodation UEI pattern - 1969		Post Iodation UEI pattern - 1980	
		ug/gm Creatinine	Equivalent to intake of ug/day	Value ug/day	Equivalent to intake of ug/day
1.	Jumla	20.2 ± 3.04	20.2 ± 3.04	-	-
	- Sinja valley	-	-	1.1	11
	- Nila valley	-	-	2.4	24
2.	Trisuli	21.6 ± 1.59	21.6 ± 1.59	6.1	61
3.	Rasuwa	-	-	3.4	34
4.	Kathmandu	-	-	6.5	65
5.	Control value (Delhi)	76.4 ± 10.2	76.4 ± 10.2	-	-
6.	Normal value	-	-	5 to 10	50 to 100

* Source: Reference No.2 and 7

TABLE - VI

PRE-IODATION AND POST-IODATION (PRE-IODISED OIL INJECTION) GOITRE PREVALENCE IN SOME AREAS OF NEPAL*

a) TRISULI AREA

Investigator	Year of survey	Population Group surveyed	Age Groups	Total No. examined	Goitre Prevalence	Visible Goitre Prevalence	Nodular Goitre
Ramalingaswami et al (pre salt iodation)	1969	Children (mostly boys) in schools	9 to 14	39	100 %	40 %	Nil
			15 to 20	121	74 %	40 %	Nil
Delange et al (post salt iodation & pre injection)	1976	Children in village	10 to 14	N.A.	44 %	4.8%	10.7%
			15 to 19	N.A.	36.6%	7.7%	11.5%
Ramalingaswami et al	1969	3 villages	all	100	65 %	N.A.	7 %
Delange et al	1976	10 villages	all	1660	55.3%	28.5%	35.7%
Bhattarai et al (post salt iodation & pre injection)	1979	N.A.	all	258	55 %	7 %	N.A.

b) JUMLA AREA

Ramalingaswami et al (pre iodation)	1969	Children in Schools (mostly boys)	8 to 14	78	88 %	70 %	13 %
			15 to 20	34	97 %	70 %	2 %
	1969	1 village	all	87	87 %	N.A.	35 %
Bhatterai et al	1979	Nila Valley	all	978	68 %	20 %	N.A.
		Sinja Valley	all	441	84 %	40 %	N.A.

*SOURCE: References 2, 6, 7, 8, 9
N.A.: Not Available

TABLE - VII

DISTRICTWISE DISTRIBUTION OF POPULATION INJECTED WITH IODISED OIL INJECTION*

Fiscal Year	Sr.No.	Districts	Total Population	Target Popula-lation	Population Injected	% of Total Population
1979-1980 Pilot Programme	1.	Rasuwa	29,765	Not set	22,000	73.9
	2.	Jumla	67,545	Not set	63,000	93.5
1980-1981	3.	Mugu	40,658	31,900	32,060	78.9
	4.	Humla	21,283	17,200	16,891	79.4
	5.	Kalikot	87,542	66,800	36,652	41.9
	6.	Dolpa	21,845	19,500	15,150	71.1
	7.	Bajhang	122,129	83,000	82,779	67.8
	8.	Bajura	74,061	56,000	50,483	79.0
1981-1982	9.	Barchula	90,497	62,700	52,603	58.1
	10.	Jajarkot	97,117	83,000	61,596	63.4
	11.	Sankhuwa-Sabha	129,513	108,300	88,955	68.7
1982-1983	12.	Gorkha	232,091	20,900	197,425	85.0
	13.	Lamjung	154,318	130,800	127,815	83.0
	14.	Manang	6,210	5,000	4,000	80.0
	15.	Mustang	12,399	11,000	10,722	86.0
		TOTAL:	11,86,973	-	8,62,160	72.6
1983-1984	16.	Dhading	243,042	218,738	D.A.	-
	17.	Nuwakot	203,111	182,800	D.A.	-
	18.	Sindhu Palohok	232,804	209,524	D.A.	-
	19.	Dolkha	150,494	135,445	D.A.	-
1984-1985	20.	Taplejung	116,884	105,198	D.A.	-
	21.	Panchathar	153,142	137,828	D.A.	-
	22.	Solukhambu	57,444	48,700	D.A.	-
	23.	Bhojpur	192,789	173,518	D.A.	-

*SOURCE: References: 6 and 11

: D.A. - Data awaited

TABLE - VIII

PREVALENCE OF GOITRE AND CRETINISM IN NEPAL**

Region	Sr. No.	District	No. Examined	Goitre		Cretinism
				Total %	Visible %	%
Eastern	1.	Sankhuasabha	5,562	25.0	3.1	0.68
Central	2.	Rasuwa	2,575	62.0	22.9	4.8
	3.	Trisuli* (Nuwakot)	258	55.0	7.0	-
	4.	Kathmandu*	880	56.0	6.0	-
Western	5.	Lamjung	3,036	52.4	5.1	0.5
	6.	Gorkha				
		- Northern half	750	70.0	27.1	1.6
		- Southern half	3,111	40.2	5.4	1.0
	7.	Mustang	355	66.2	28.5	2.0
Mid-Western	8.	Mugu	1,970	72.0	12.4	3.8
	9.	Kalikot	890	38.1	3.2	-
	10.	Jumla*				
		- Nila Valley	975	67.9	20.1	0.8
		- Sinja Valley	441	83.9	39.9	10.6
	11.	Surkhet*	2,576	60.0	33.3	0.8
Far-Western	12.	Bajura	2,649	73.9	21.8	1.0
	13.	Darchule	345	28.0	10.2	4.6

**SOURCE: References: 6 & 9*

ACKNOWLEDGEMENT

We wish to thank Mr. Rolf C. Carriere, Regional Programme Officer, UNICEF, ROSCA, New Delhi who initiated, sponsored and supported the visit at various stages. Our thanks are particularly due to Mr. Ramesh Shreshtha, the dynamic Programme Officer (Health), UNICEF Kathmandu, Nepal whose keen interest and spontaneous co-operation helped us enormously in gathering the relevant information during our short stay in Kathmandu. Thanks are also due to Dr. K. B. Singh, Project Chief, Expanded Immunization, Ministry of Health, Kathmandu, Nepal, Dr. Vijaya Gurabacharya, Chief, Central Health Laboratory, Kathmandu for providing opportunity to discuss and help us in our effort to study the situation. The highly informative discussion we have had with Mr. H. B. Malla, General Manager, Salt Trading Corporation, Nepal has greatly facilitated our work and thanks are due to him for his kind co-operation. We wish to thank Mr. Malcolm R. Kennedy, UNICEF Representative, Nepal and Dr. P. Micovic, WHO Representative, Nepal for discussing the guidelines for carrying out the evaluation programme.

1082A
May 1985

PRINTED AT REKHA PRINTERS PVT. LTD., NEW DELHI-110020